



To: T10 Technical Committee
From: Kevin Marks
Date: June 12, 2006
Subject: T10/06-210r2 – SAS-2: Reporting ZONE PARTICIPATING CAPABLE in the IDENTIFY address frame

Revision History

Revision 0 (5/07/06) – Initial proposal

Revision 1 (5/31/06) – Changes based on May SAS Protocol WG discussions.

- Updated to Rev 4
- Add section 4.1.3
- Fix Participating spelling in table 26
- Removed setting ZONE GROUP PERSISTENT bit to one when both transmitted and received CONFIGURED ZONE PARTICIPATING bit is one and requirement that is the ZONE GROUP PERSISTENT bit be set to one when the ZONE PARTICIPATING bit is set to one.
- Added ZONE PARTICIPATING PERSISTENT bit that when set to zero, sets the CONFIGURED ZONE PARTICIPATING bit to zero if the received SAS address is different from the previously received address. This allows the connection of two ZPSDS to remain separated until the zone manager is ready to mix them.

Revision (6/12/06) - Changes based on June 2 SAS Protocol conference call discussions.

- Updated the CONFIGURED ZONE PARTICIPATING bit text in 4.8.3.1.
- Removed redundant statement about if ZP=1 then ZG=1
- Removed CONFIGURED ZONE PARTICIPATING CHANGEABLE bit from SMP Discover response
- Fixed byte numbering in Discover response
- Added LAST CONFIGURED ZONE PARTICIPATING bit in the SMP Discover response to indicate what the CONFIGURED ZONE PARTICIPATING bit was set to during the last occurring identification sequence.
- Added ZONE PARTICIPATING PERSISTENT bit to the IDENTIFY address frame and modified table 27 to compare transmitted and received bits.

Related Documents

T10/1760-D - SAS-2 Revision 4

06-201r1 SAS-2 SMP CONFIGURE PHY ZONE functions

06-260r0 SAS-2 zone management use cases

[New text to be added](#)

~~Text to be deleted~~

Editorial Text

Overview

As currently defined in SAS-2r4, the ZONE PARTICIPATING bit defines the boundary of the ZPSDS, for each phy in a zoning expander device, if set to one, indicated it is within the ZPSDS and if set to zero then it is on the boundary. Because this value may be programmable with a SMP CONFIGURE PHY ZONE function, it leaves a possibility of interoperability issues between zoning devices and non-zoning devices (e.g. SAS-1.1 devices). This proposal aims at removing this possibility of interoperability issues by automating the value of the ZONE PARTICIPATING bit depending on what is attached and a configured value.

This proposal defines a CONFIGURED ZONE PARTICIPATING bit in the IDENTIFY address frame that indicates if the phy has been configured to be inside the ZPSDS or on the boundary. Depending on the value transmitted and received in the IDENTIFY address frame, the actual ZONE PARTICIPATING bit value may change after a link reset sequence if the received value is set to zero and transmitted value is set to one. Additionally this proposal defines the effects on the ZONE GROUP field and when both the transmitted and received CONFIGURED ZONE PARTICIPATING bit is set to one. The proposed changes to the ZONE GROUP field are an automation of a set of rules already defined in SAS-2r4.

The latest revision of this proposal also include the ZONE PARTICIPATING PERSISTENT bit that if set to zero sets the CONFIGURED ZONE PARTICIPATING bit and ZONE PARTICIPATING bit to zero if the received SAS address is different from the previously received address. Additionally adds a LAST CONFIGURED ZONE PARTICIPATING bit in the SMP Discover response to indicate what the CONFIGURED ZONE PARTICIPATING bit was set to during the last identification sequence. This allows the connection of two ZPSDS to remain separated until the zone manager is ready to mix them as modeled in 06-260r0.

Suggested Changes to SAS-2r4:

4 General

4.1 Architecture

4.1.1 Architecture overview

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4.1.2 Physical links and phys

<< ...⁷th Paragraph...>>

During the identification sequence (see 7.9), a phy:

- a) transmits an IDENTIFY address frame including the device type (i.e., end device, edge expander device, or fanout expander device) of the device containing the phy, the SAS address of the SAS port or expander device containing the phy, the device name of the SAS device or expander device containing the phy, the phy identifier, and bits specifying the SSP initiator phy capability, STP initiator phy capability, SMP initiator phy capability, SSP target phy capability, STP target phy capability, ~~and~~ SMP target phy capability, [configured zone participating value and zone participating persistent value](#).
- b) receives an IDENTIFY address frame containing the same set of information from the attached phy, including the attached device type, the attached SAS address, the attached device name, the attached phy identifier, and bits indicating the attached SSP initiator phy capability, attached STP initiator phy capability, attached SMP initiator phy capability, attached SSP target phy capability, attached STP target phy capability, ~~and~~ attached SMP target phy capability, [configured zone participating value and zone participating persistent value](#).

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4.1.3 Ports (narrow ports and wide ports)

<< ...⁶th paragraph... >>

Phys that are able to become part of the same wide port shall set the DEVICE TYPE field, SSP INITIATOR PORT bit, STP INITIATOR PORT bit, SMP INITIATOR PORT bit, SSP TARGET PORT bit, STP TARGET PORT bit, SMP TARGET PORT bit, [ZONE PARTICIPATING PERSISTENT bit](#), [CONFIGURED ZONE PARTICIPATING bit](#) and SAS ADDRESS field in the IDENTIFY address frame (see 7.8.2) transmitted during the identification sequence to the same set of values on each phy in the wide port. Recipient wide ports are not required to check the consistency of these fields across their phys.

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4.8 Zoning

4.8.1 Zoning overview

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4.8.2 Zoning expander device requirements

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4.8.3 Zone operation

4.8.3.1 Zone phy information

Each phy of a zoning expander device shall support the following zone phy information fields:

- a) [CONFIGURED_ZONE_PARTICIPATING bit](#);
- b) [ZONE_PARTICIPATING_PERSISTENT bit](#)
- c) ZONE PARTICIPATING bit;
- ~~b~~d) ZONE ADDRESS RESOLVED bit;
- ~~e~~e) ZONE GROUP PERSISTENT bit; and
- ~~f~~f) ZONE GROUP field.

<<... Anyone is welcome to come up with a better name for the CONFIGURED_ZONE_PARTICIPATING bit, and ZONE_PARTICIPATING_PERSISTENT bit? Programmed, requested, etc. The SMP CONFIGURE_PHY_ZONE function needs to change the ZONE_PARTICIPATING bit to the CONFIGURED_ZONE_PARTICIPATING bit or new name and add the ZONE_PARTICIPATING_PERSISTENT bit ...>>

The CONFIGURED_ZONE_PARTICIPATING bit is used to establish the boundary of the ZPSDS. The CONFIGURED_ZONE_PARTICIPATING bit is transmitted in the IDENTIFY address frame (see 7.8.2) to the attached phy and is used to configure the values of other zone phy information fields after a link reset sequence (see 4.8.4). The CONFIGURED_ZONE_PARTICIPATING bit set to one specifies that the CONFIGURED_ZONE_PARTICIPATING bit be set to one when transmitting the IDENTIFY address frame. The CONFIGURED_ZONE_PARTICIPATING bit set to zero specifies that the CONFIGURED_ZONE_PARTICIPATING bit be set to zero when transmitting the IDENTIFY address frame.

The ZONE_PARTICIPATING_PERSISTENT bit specifies the method used to determine the value of the ZONE PARTICIPATING bit after a link reset sequence (see 4.8.4). The ZONE PARTICIPATING_PERSISTENT bit is transmitted in the IDENTIFY address frame (see 7.8.2) to the attached phy and is used to configure the values of other zone phy information fields after a link reset sequence (see 4.8.4). The ZONE PARTICIPATING_PERSISTENT bit set to one specifies that the ZONE PARTICIPATING_PERSISTENT bit be set to one when transmitting the IDENTIFY address frame. The ZONE PARTICIPATING_PERSISTENT bit set to zero specifies that the CONFIGURED_ZONE_PARTICIPATING bit be set to zero when transmitting the IDENTIFY address frame.

The ZONE PARTICIPATING bit indicates if the phy is a boundary of the ZPSDS. The ZONE PARTICIPATING bit ~~shall be~~ set to zero indicates when the phy is attached to an end device, ~~or~~ an expander device that does not support zoning or an expander device that has zoning disabled (see x.x.x). The ZONE PARTICIPATING bit ~~shall be~~ set to one indicates when the phy is attached to a zoning expander device and is inside the boundary of the ZPSDS. The ZONE PARTICIPATING bit is not directly changeable and shall only change following a link reset sequence. The value of the ZONE PARTICIPATING bit is dependent on the values of the CONFIGURED_ZONE_PARTICIPATING bit, the CONFIGURED_ZONE PARTICIPATING bit received in the IDENTIFY address frame, the ZONE PARTICIPATING_PERSISTENT bit and the ZONE PARTICIPATING_PERSISTENT bit received in the IDENTIFY address frame (see 4.8.4).

The ZONE ADDRESS RESOLVED bit specifies the method used to determine the source zone group for a connection request received by a phy at the boundary of the ZPSDS as specified in table 24 (see 4.8.3.5).

The ZONE ADDRESS RESOLVED bit may be set to one when:

- a) the phy is contained within a zoning expander device; and
- b) the ZONE PARTICIPATING bit for the phy is set to zero.

The ZONE ADDRESS RESOLVED bit shall be set to zero when:

- a) the phy is contained within a non-zoning expander device; or
- b) the phy is contained within a zoning expander device and the ZONE PARTICIPATING bit for the phy is set to one.

The ZONE GROUP field has a value in the range of 0 to 127 that indicates the zone group to which the phy belongs. ~~If the ZONE PARTICIPATING bit of the phy is set to one, the ZONE GROUP field shall be set to 4.~~ The zone group of the SMP initiator port and SMP target port in a zoning expander device shall be 1.

The ZONE GROUP PERSISTENT bit specifies the method of determining the zone group value of the phy after a link reset sequence (see 4.8.4). ~~If the ZONE PARTICIPATING bit is set to one, the ZONE GROUP PERSISTENT bit shall be set to one.~~

All phys in an expander port shall have the same zone phy information (see 4.6.2). The default (e.g., power on) values for the zone phy information fields are vendor-specific.

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4.8.4 Zone **groups** phy information and link reset sequences

At the completion of a link reset sequence (see 4.4) and a SATA device is attached, the zoning expander device shall set the ZONE PARTICIPATING bit to zero.

At the completion of a link reset sequence and a SATA device is not attached, the zoning expander device shall compare the CONFIGURED ZONE PARTICIPATING bit and the ZONE PARTICIPATING PERSISTENT bit in the zone phy information with the CONFIGURED ZONE PARTICIPATING bit and ZONE PARTICIPATING PERSISTENT bit received in the IDENTIFY address frame (see 7.8.2) from the attached phy. Table 27 specifies the affected phy zone information fields depending on the values of the transmitted and received CONFIGURE ZONE PARTICIPATING bits and transmitted and received ZONE PARTICIPATING PERSISTENT bits.

Table 27 — Phy zone information fields affected by a link reset sequence

<u>Transmitted CONFIGURE ZONE PARTICIPATING bit</u>	<u>Received CONFIGURE ZONE PARTICIPATING bit</u>	<u>Transmitted ZONE PARTICIPATING PERSISTENT bit</u>	<u>Received ZONE PARTICIPATING PERSISTENT bit</u>	<u>Affected Phy Zone Information</u>
<u>Zero</u>	<u>Zero</u>	<u>Zero or one</u>	<u>Zero or one</u>	<u>The zoning expander device shall set the ZONE PARTICIPATING bit to zero.</u>
<u>One</u>	<u>Zero</u>			
<u>Zero</u>	<u>One</u>			
<u>One</u>	<u>One</u>	<u>Zero</u>	<u>Zero</u>	<u>Either :</u> a) <u>If the SAS address received in the IDENTIFY address frame during the identification sequence is different from the SAS address prior to the completion of the link reset sequence, then the zoning expander device shall set the CONFIGURE ZONE PARTICIPATING bit to zero and the ZONE PARTICIPATING bit set to zero.</u> b) <u>If the SAS address received in the IDENTIFY address frame during the identification sequence is the same as the SAS address prior to the completion of the link reset sequence, then the zoning expander device shall set:</u> A) <u>the ZONE PARTICIPATING bit to one;</u> B) <u>the ZONE GROUP field to one; and</u> C) <u>the ZONE ADDRESS RESOLVED bit to zero.</u>
		<u>Zero</u>	<u>One</u>	
		<u>One</u>	<u>Zero</u>	
		<u>One</u>	<u>One</u>	

If the ZONE GROUP PERSISTENT bit is set to one, then a link reset sequence (~~see 4.4~~) shall not cause the zone group value of an expander phy to change unless the ZONE PARTICIPATING bit changes to one as specified in table 27. If the ZONE GROUP PERSISTENT bit is set to zero, then table 286 specifies events based on the initial condition of the expander phy that shall cause the zoning expander device to change the ZONE GROUP field of the expander phy to its default value (e.g., zero).

Table 287 — Events that cause the ZONE GROUP field to be set to its default value when the ZONE GROUP PERSISTENT bit set to zero

Initial condition	Event after the initial condition is established
Completed link reset sequence with a SAS device attached	<p>A subsequent link reset sequence completes and:</p> <ul style="list-style-type: none"> a) the SAS address received in the IDENTIFY address frame (see 7.8.2) during the identification sequence is different from the SAS address prior to the completion of the link reset sequence; or b) a SATA device is attached.
Completed link reset sequence with SATA device attached	<p>Either:</p> <ul style="list-style-type: none"> a) A subsequent link reset sequence completes and: <ul style="list-style-type: none"> A) a hot-plug timeout (see 6.7.5) occurred between the time of the initial condition and the time the link reset sequence completed; B) the zoning expander device has detected the possibility that a new SATA device has been inserted. The method of detection is outside the scope of this standard (e.g., an enclosure services process reports a change in the ELEMENT STATUS CODE field in the Device or Array Device element (see SES-2), or a change in the WORLD WIDE NAME field in the attached SATA device's IDENTIFY DEVICE or IDENTIFY PACKET DEVICE data (see ATA8-ACS)); or C) a SAS device is attached; or b) The expander phy is disabled with the SMP PHY CONTROL function (see 10.4.3.13) DISABLE phy operation.

7.8.2 IDENTIFY address frame

Table 98 defines the IDENTIFY address frame format used for the identification sequence. The IDENTIFY address frame is sent after the phy reset sequence completes if the physical link is a SAS physical link.

Table 98 — IDENTIFY address frame format

Byte\Bit	7	6	5	4	3	2	1	0
0	Restricted (for OPEN address frame)	<u>DEVICE TYPE</u>			ADDRESS FRAME TYPE (0h)			
1	Restricted (for OPEN address frame)							
2	<u>Reserved</u>				SSP INITIATOR PORT	STP INITIATOR PORT	SMP INITIATOR PORT	Restricted (for OPEN address frame)
3	<u>Reserved</u>				SSP TARGET PORT	STP TARGET PORT	SMP TARGET PORT	Restricted (for OPEN address frame)
4	DEVICE NAME							
11								
12	SAS ADDRESS							
19								
20	PHY IDENTIFIER							
21	<u>Reserved</u>				<u>ZONE PARTICIPATING PERSISTENT</u>	<u>CONFIGURED ZONE PARTICIPATING</u>	BREAK_REPLY CAPABLE	
22	Reserved							
27								
28	(MSB)	CRC						(LSB)
31								

<< The ZONE PARTICIPATING PERSISTENT bit was added to the IDENTIFY address frame above, because of the removal of the requirement to initiate a new link reset sequence (in r1) when the ZONE PARTICIPATING PERSISTENT bit in the zone phy information is set to zero and the SAS address changes. If the ZONE PARTICIPATING PERSISTENT bit is not included in the IDENTIFY address frame then it is possible that each side of the link could end up with different ZONE PARTICIPATING bit if the ZONE PARTICIPATING PERSISTENT bit is different. I still prefer initiating a new link reset sequence.>>

<< 9th Paragraph after table 98 ..>>

The PHY IDENTIFIER field specifies the phy identifier of the phy transmitting the IDENTIFY address frame.

The CONFIGURED ZONE PARTICIPATING bit specifies the value of the CONFIGURED ZONE PARTICIPATING bit in the zone phy information fields (see 4.8.3.1) at the time the IDENTIFY address frame is transmitted. If the phy transmitting the IDENTIFY address frame is contained in an end device or non-zoning expander device, then the CONFIGURED ZONE PARTICIPATING bit shall be set to zero.

The ZONE PARTICIPATING PERSISTENT bit specifies the value of the ZONE PARTICIPATING PERSISTENT bit in the zone phy information fields (see 4.8.3.1) at the time the IDENTIFY address frame is transmitted. If the phy transmitting the IDENTIFY address frame is contained in an end device or non-zoning expander device, then the CONFIGURED ZONE PARTICIPATING bit shall be set to zero.

The BREAK_REPLY CAPABLE field specifies that the phy is capable of responding to received BREAK primitive sequences with a BREAK_REPLY primitive sequence (see 7.12.5).

See 4.1.3 for additional requirements concerning the DEVICE TYPE field, SSP INITIATOR PORT bit, STP INITIATOR PORT bit, SMP INITIATOR PORT bit, SSP TARGET PORT bit, STP TARGET PORT bit, SMP TARGET PORT bit, and SAS ADDRESS field.

The CRC field is defined in 7.8.1.

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10.4.3.5 DISCOVER function

<< ... >>

Table 204 — DISCOVER response (part 2 of 2)

Byte\ Bit	7	6	5	4	3	2	1	0	
48	Reserved								
49									
50	Vendor Specific								
51									
52	ATTACHED DEVICE NAME								
59									
60	ATTACHED CONFIGURED ZONE PARTICIPATING	ZONE PARTICIPATING PERSISTENT	LAST CONFIGURED ZONE PARTICIPATING	CONFIGURED ZONE PARTICIPATING	ZONE ADDRESS RESOLVED	ZONE GROUP PERSISTENT	ZONE PARTICIPATING	ZONE ENABLED	
61	Reserved								
62									
63	ZONE GROUP								
64	(MSB)	CRC							
67								(LSB)	

<< ... >>

The ATTACHED DEVICE NAME field shall be updated:

- a) after the identification sequence completes, if a SAS phy or expander phy is attached; or
- b) after the COMSAS Detect Timeout timer expires (see 6.8.3.9), if a SATA phy is attached.

The ATTACHED CONFIGURED ZONE PARTICIPATING bit indicates the value of the CONFIGURED ZONE PARTICIPATING bit received in the IDENTIFY address frame (see 7.8.2) from the attached phy during the identification sequence.

The ZONE PARTICIPATING PERSISTENT bit contains the value of the ZONE PARTICIPATING PERSISTENT bit in the zone phy information (see 4.8.3.1).

The LAST CONFIGURED ZONE PARTICIPATING bit contains the value of the CONFIGURED ZONE PARTICIPATING bit in the zone phy information transmitted in the IDENTIFY address frame (see 7.8.2) during the last the identification sequence.

The CONFIGURED ZONE PARTICIPATING bit contains the value of the CONFIGURED ZONE PARTICIPATING bit in the zone phy information (see 4.8.3.1).

The ZONE ADDRESS RESOLVED bit contains the value of the ZONE ADDRESS RESOLVED bit in the zone phy information (see 4.8.3.1).

The ZONE GROUP PERSISTENT bit contains the value of the ZONE GROUP PERSISTENT bit in the zone phy information (see 4.8.3.1).

The ZONE PARTICIPATING bit contains the value of the ZONE PARTICIPATING bit in the zone phy information (see 4.8.3.1).

A ZONING ENABLED bit set to one indicates that zoning is enabled in the expander device and that the ATTACHED CONFIGURED ZONE PARTICIPATING bit, ZONE PARTICIPATING PERSISTENT bit, LAST CONFIGURED ZONE PARTICIPATING bit, CONFIGURED ZONE PARTICIPATING bit, ZONE ADDRESS RESOLVED bit, the ZONE GROUP PERSISTENT bit, the ZONE PARTICIPATING bit, and the ZONE GROUP field are valid. A ZONING ENABLED bit set to zero indicates that zoning is disabled in the expander device and that those fields are not valid.

The ZONE GROUP field contains the value of the ZONE GROUP field in the zone phy information (see 4.8.3.1). Zone group values between 128 and 255, inclusive, are reserved.

The CRC field is defined in 10.4.3.2.